

Larch, which formerly was often planted with spruce, has lost much of its importance as a forest tree, on account of its deterioration in this part of Germany.

Charcoal
manufacture.

Under former arrangements, great quantities of wood were made into charcoal for the Government silver and iron mines, but when the latter were required to credit the forests with the real value of such charcoal, they soon made other more economic arrangements, and the result has been that coal is now wisely burnt by this establishment.

Roads.

Owing to the extensive manufacture of charcoal, roads for the carriage of timber were less necessary on the Harz than elsewhere, and this circumstance still places some of the Harz forests at a disadvantage.

In the construction of such roads at present, the gradient varies between 3 and 6 feet in 100.

SILVER FIR AND SPRUCE FORESTS OF THE BLACK FOREST.

Black forest
mountains.

As suggested in the memorandum for the guidance of forest officers, I visited the Black Forest mountains with a view of seeing the management of the silver fir forests on those mountains and the transport of timber as far as such could be of use to me in India hereafter.

For this purpose I went to the Forst revier Rippoldsau, the adjoining districts of the State forests of the Grand-Duchy of Baden, and the Freudenstadt forests in the kingdom of Württemberg.

On my return from there to Hanover the forests on the Hauptsmoor, near Bamberg, in Bavaria, where the natural reproduction of the Scotch fir is managed very successfully, were also visited.

The silver-fir
forests.

The Black Forest mountains are one of the homes of the silver fir, the forests of which, near Rippoldsau, are situated between 2,000 and 3,000 feet, and therefore at an average height of 2,600 feet above the sea.

The winters are severe, with an average depth of three and a half feet of snow in the valleys from December until March, whilst on the hills the average depth of snow is five to eight feet from the beginning of November until the middle of April.

Management.

They are partly regulated forests, in which, however, a gradual felling for the natural reproduction of them is carried on over one-fourth or one-third of the whole area at once,

from which every year during a period of 30 or 40 years the largest trees are removed, whilst the rest are allowed to grow to a larger size during the remaining years.

This is done, as the price these large trees fetch is much higher in proportion than that of smaller ones, and all are felled and removed in one piece if possible.

Natural reproduction is chiefly resorted to in these forests, which, in consequence of the young plants growing well in the shade of the old trees, is very easily accomplished, even though it is extended over such a long period as 30 or 40 years. Natural reproduction.

To be able to keep as many trees as possible growing on the lands on which the regeneration of the forest is going on the branches up to one-third or two-thirds of the height of the tree are sawn off to admit air and light for the young plants, which does no harm to the silver fir, but on the contrary is said to aid the more rapid increase of the trunk, whilst the branches are used for litter.

This sawing off of the branches is commenced from above by men who climb up the trees, and who earn from 1s. 4d. to 2s. a day.

Regular seed-bearing seasons occur at longer or shorter intervals, but nearly every year there is sufficient seed to increase the number of young plants where it is wanted.

Moss cover is very favourable for the germination of the seed, whilst such places which get covered with grass or weeds, or where for other reasons the seed does not germinate freely the soil is at once prepared by clearing and slightly loosening it in strips or patches for the reception of the seed, the germination of which is thus facilitated. Aiding of natural reproduction.

If the open space in the forest is so large that the seed from the old trees does not reach the whole of it, sowing by hand is resorted to early, so as to let the young plants be as nearly as possible of the same age.

If by the time the old trees are nearly all removed there are still some parts not yet covered with young trees, planting is resorted to.

For the better growth of such planted trees the existing groups are somewhat rounded off to avoid the young trees planted having to struggle with the others, perhaps already 20 to 30 years old, and where on incompletely stocked spaces, which have to be filled up by planting, there are single trees of some 20 to 30 years, they are cut down altogether; or, if they are standing in numbers and are not quite so large some of the lower branches are lopped off the outer ones, so as not to interfere with those planted.

These plants are either taken from nurseries or out of the forest if the latter have not grown in too deep shade, which would render them liable to suffer on being removed into open places.

Collecting
of seed and
nursery
management.

The seed is collected with some risk from the trees in October, before the cones open and it falls out.

As the seeds are very oily they are best kept in the cones or sown at once. The sowing is done on prepared beds in rows four inches apart, and after germination the ground is covered with moss to keep the moisture in the ground.

The seedlings one year old are transplanted into rows six or seven inches apart and three inches between the plants in the rows, after which the soil between them is also covered with moss.

Here they have to remain for two or three years before they are fit for transplanting.

Shade from the side is very beneficial for the seed beds as well as for the nursery.

Plants from the nursery are preferable to those out of the forest, and the latter, when used, are as a rule removed with some of the soil adhering to the roots.

Planting.

Planting is better done in spring than in autumn, and in the usual way, the roots of the young plants being cut as may be necessary.

They have to be sheltered as far as possible against sun, dryness, or spring frosts, and the plants as a rule thrive better on the cool northerly and easterly slopes of the mountains than anywhere else.

The silver fir grows very slowly at first, and does not get much higher than six inches within the first four or five years.

At the age of 25 years it begins to grow very fast, and increases most between the age of 80 and 120 years.

It likes best a deep, cool, moist, and loamy soil, with a covering of moss on it, and sends its roots deeper than the spruce, in consequence of which it suffers less from the wind and storms than the latter.

Other trees
with the
silver fir.

On southern slopes of the mountains it sometimes fails, or only partly succeeds, and then Scotch fir is planted to fill up the space. The latter grows in such localities here in the mountains very luxuriantly and to a great size.

A number of spruce are sprinkled through the forest nearly everywhere, and are generally employed when natural reproduction has to be supplemented by planting.

Fellings.

Fellings are conducted from an easterly direction towards the west, as the prevailing winds come from the latter direction.

Thinnings generally become necessary about the thirtieth year, after which they have to be repeated every tenth year until the gradual felling of the largest trees commences.

These fellings are regulated by the requirements of the young seedlings, and carried out very gradually and only sufficient to admit as much light as is absolutely necessary for the young plants, leaving as many of the old trees to grow as large as they can.

It also happens that some of the best trees are left standing or are held over for the next rotation to obtain exceptionally large timber.

This can however only be done in somewhat sheltered positions, and on rocky ground, where the storms are less liable to overthrow them.

∴ Some damage is always done to the young plants by the removal of the old trees, but the silver fir seems to repair them almost faster than any other coniferous tree.

It is also remarkable for its high and more cylindrical stem than other conifers, and the comparatively large amount of timber it produces, which is much used for masts in ships, axletrees of windmills, buildings, and other purposes; and although it is admitted to be somewhat inferior to spruce, it fetches in the Black Forest mountains the same price as spruce.

The long and barked logs of conifers here are valued according to their length and their diameter at the smaller end.

Whilst small wood is moved on sledges in winter, timber is transported either by dragging with horses, let down the hill side by means of ropes, sent down timber slips, and floated on the mountain streams, all of which methods are very instructive, and it is hoped will prove of use to me in India, where I have felt the want of it already, previous to this.

The dragging by horses is simple; it is done on comparatively level ground, by means of a rope fastened to a wedge (Fig. 3) driven into the end of the logs, and needs no further description.

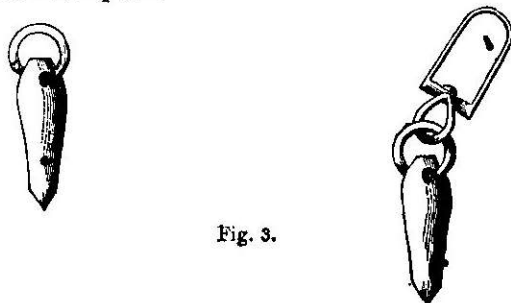


Fig. 3.

Lowering by
ropes.

The wedge used is 6 inches long oy $1\frac{1}{2}$ inches broad, whilst the ring is about $2\frac{1}{2}$ –3 inches in diameter.

The lowering of logs by ropes is employed for letting them down steep hill sides, and is sometimes connected with danger to life and limb to those who have to carry it out if they lose control over the rope on the descending log.

The rope in this, as in the previous case, is either fastened on to the log by means of the wedge already mentioned, or, if the log is too heavy, by means of a very strong and peculiarly shaped hook (Fig. 4), which is sufficient for the heaviest and largest timber.

This hook is 18 inches long, and the ring attached to it about 6 inches in diameter.

To be able to regulate the rate at which the log travels, and to have the power of checking it when required, the rope is wound several times round a tree or strong post before the log is started.



Fig. 4.

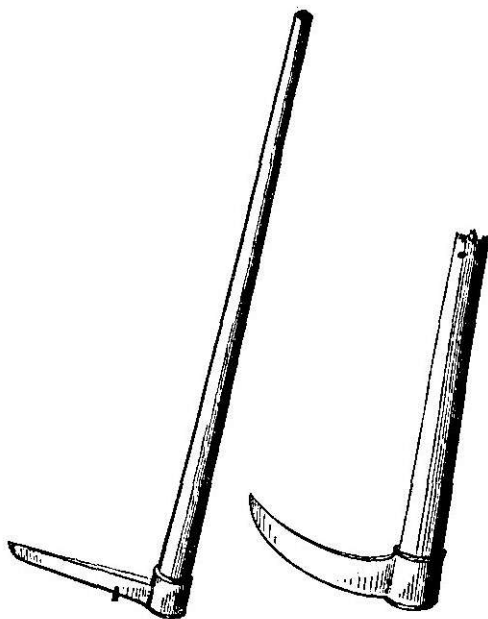


Fig. 5.

For the setting in motion or otherwise moving these long and heavy logs the men use a kind of pick (Fig. 5), which

by its strong and long handle gives them great power of leverage, when the point is placed under the log and the handle drawn towards them.

The wooden handle of this pick is 4-4½ feet long, and at the thinnest end 1-2 inches thick. The iron is about 13 to 14 inches long, 1½ inches broad, and ½ inch thick; the head of it being 2½ inches high by 2 inches broad.

The timber slips are constructed very simply, but are for Timber slips. all that very efficient for the transport of the timber out of the hills to a point where the streams can be used for floating timber.

They are simple bridle paths cut out of the hill side, and winding around them with a gradient varying between 2 and 40 feet in 100, according to circumstances.

So, for instance, on such slips as are used in winter, when snow and ice cover them, 2-3 feet in a hundred is found sufficient for the timber to travel quickly and safely down on them, whilst for smaller wood with such a gradient it becomes necessary to place wood at intervals in the ground across the slip, as railway sleepers are put across a railway line, to give more impetus to it.

Ordinarily slips have a gradient of 10 feet, whilst the steepest have one of 35-40 feet in 100, which latter can only be used, however, in very dry weather, and dare not be exceeded; but the lowering of the logs by ropes must be resorted to if steeper descents are to be got over.

If the momentum of the travelling log is to be lessened this is sometimes effected by throwing dry earth, charcoal dust, and in winter even loose snow, on the slip, which, however, only answers for a short time, and has to be repeated.

Sudden and great changes in the gradient are provided for in the case of an increase, which might cause the logs to shoot off the slip, by a covering in of the slip at such points as far as the change extends.

In the case of a decrease, which might stop, damage, or also cause the logs to bound off the slip, the change is made more gradual through building up such points by laying logs crossways over each other, and laying a floor of the slip out of logs. Where such a floor of the slip made of logs placed close alongside of each other is required further than the length of one log, they have to be placed, as a matter of course, so as to let the upper ones overlap the lower, or to rest with their lower end against the upper end of the fol-

lowing log, so as not to have any projection against which the logs might strike in their descent.

In the case of having to cross a public road which must not be closed, on the upper or higher side of the road the slip is built up close to the road, and in the same way as those places in which the gradient suddenly decreases, to a height of six feet or more, according to the width of the road; so as to enable the log to shoot across it through the air on to the lower continuation of the slip (Fig. 6).

This construction has also to be resorted to where such a road leads along the bottom of a valley and there is not sufficient space between the road and the hill side for either storing the timber, or letting it run out, on the same side of the road.

To keep the logs on the slip in their descent, one or more logs are placed on the outer or on both sides of it, leaving a space of 3-4 feet between the sides, for the timber to travel on.

These logs on the sides are fastened firmly into the ground with wooden stakes 4-5 inches in diameter, and 4-5 feet in length, of which one is driven through the so-called shear (Fig. 7) at the end of the log, keeping it from slipping further down the hill, whilst others are driven in outside of it, to keep it from being pushed back or away from the slip, whilst it is kept from falling forward or on to the slip by the next log above overlapping it (Fig. 8).

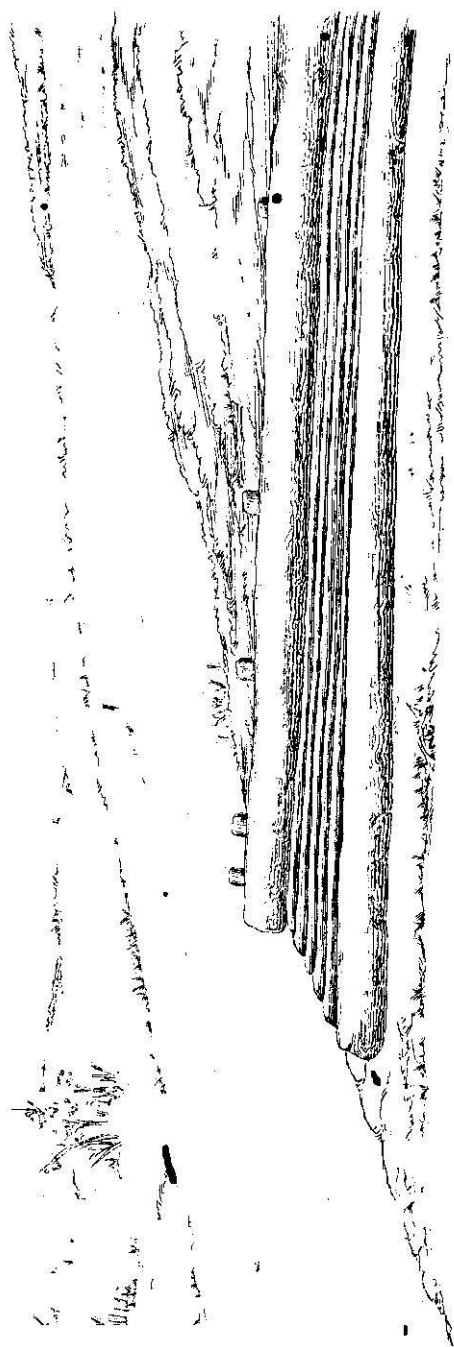
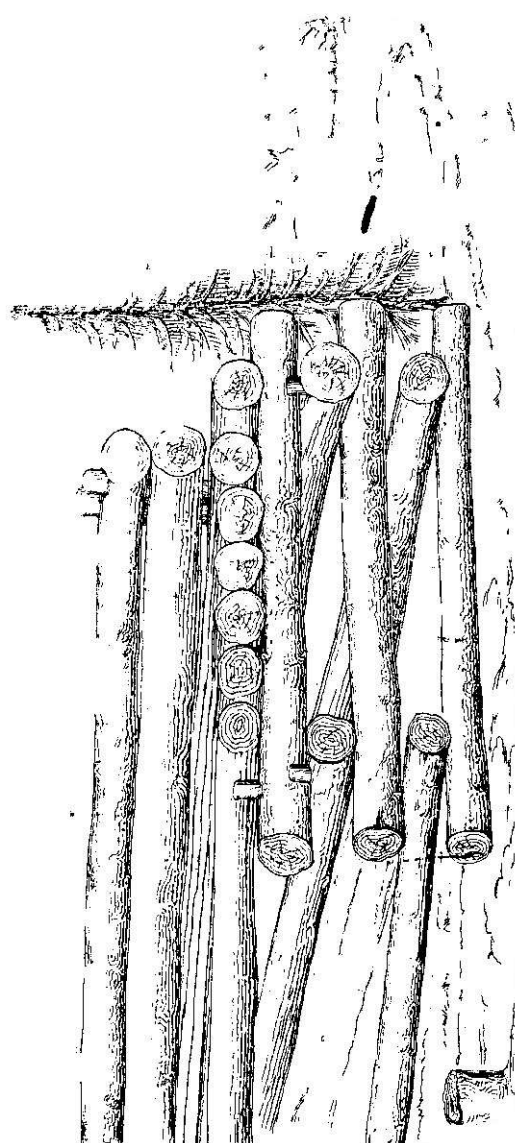
Great curves in the slip are avoided as much as possible, but where, in consequence of such, the outer side of the curve is subjected to greater wear through the concussion of the logs against it, there are in the first instance 2 or 3 laid above each other (Fig. 9), as well as being made to overlap to a greater length, viz., 20 to 30 feet, than is necessary where the slip is comparatively straight.

In the latter case, the placing of the logs against each other is often sufficient, but then, the thickest end of the log is always placed down the hill, and a shear is cut into the upper end of the log as well as into the lower one.

To place several logs above each other, holes are made through the ends, and stakes 3-4 inches in diameter driven through, and where the concussion from the descending logs is very great, another log, earth or snow are added to the stakes, driven in as support of the sides.

Junctions of slips coming from different sides of a hill must always be strengthened by overlapping to a greater extent, and by placing several logs above each other.

Fig. 6.



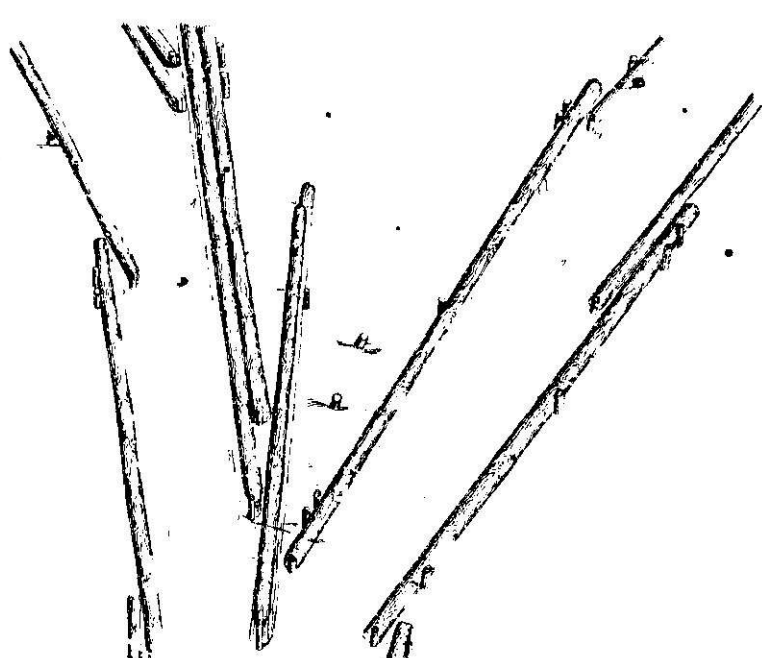


Fig. 7.

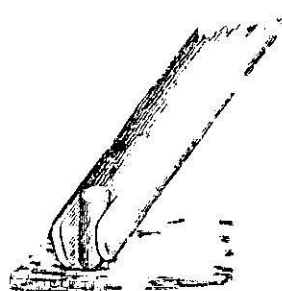
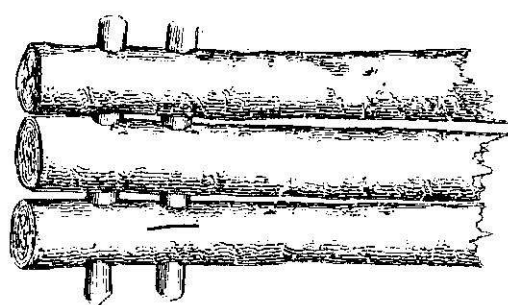
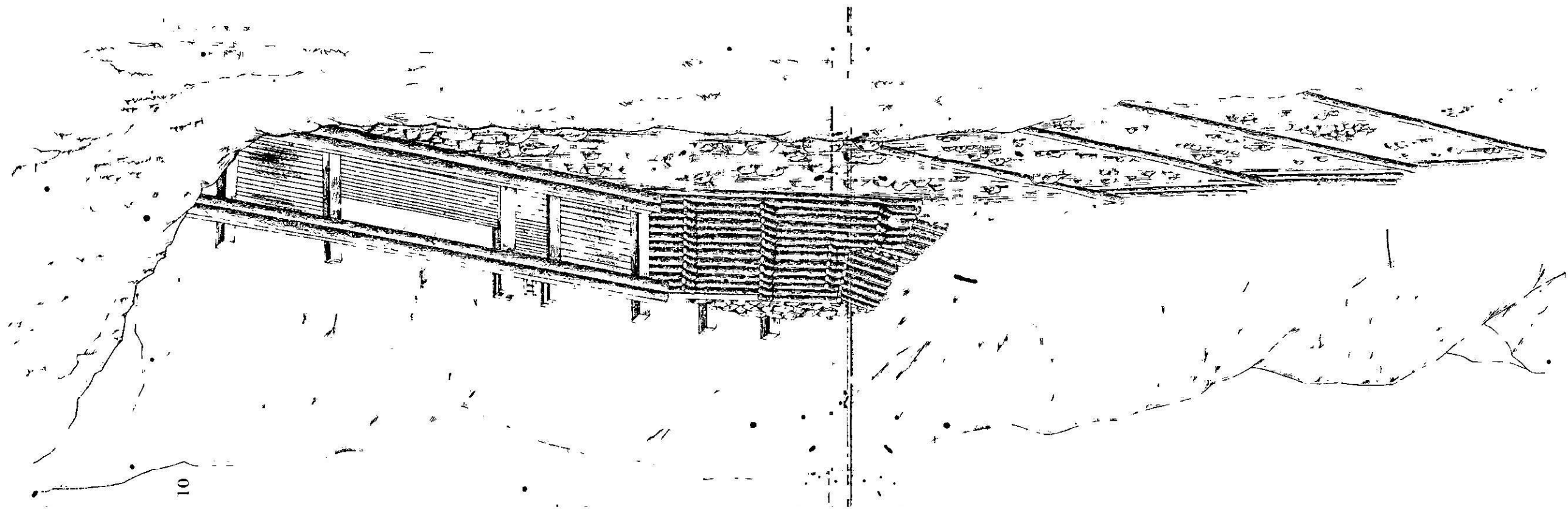


Fig. 8.



Fig. 9.





The logs used for the sides of the slips are part of the timber to be removed, and the building of a slip consequently always commences above, where the timber lies.

Logs are sent down the slip with the thick or thin end first, whichever is most convenient, with the thin end down the wood travels faster, but those required for the building of it are sent with the thick end foremost, if it can be done without much labour, and the ends which are sent down foremost are always rounded off a little.

The breaking up of the slip is done after all the timber is down, and commences also from above, so as to use the rest of the slip for the removal of these logs also.

It follows from this that the greater the quantity of timber to be removed at one time, from one spot, the cheaper the transport.

Logs are never started from above until the arrival of the preceding log, and the slip being clear below, is announced from there by the blowing of a horn, to those above, as the descending logs travel with such a force and rapidity, that they would destroy everything which offered any resistance, and where the latter is sufficiently great, as would be the case if it dashed against another log lying on the slip, both would be shattered into pieces.

The logs are either made to run out on a horizontal or slightly ascending portion of the slip, or on an open plain, like the bottom of a valley, or against the opposite side of the hill.

Nearly all the timber thus brought down from the higher hills is transported further by floating. On the small mountain streams near Rippoldsau, in which there is but very little water, this can only be managed by constructing locks, which retain considerable quantities of water at certain points of the stream until required. Floating of timber.

These locks are constructed by laying 4 long and thick logs right across the bottom of the stream, so that their ends extend into either bank for about 3-4 feet. Water locks.

These logs are fastened together by stakes, as the logs are fastened together on the timber slips.

Into these logs strong square uprights are let in, which rest above against other long logs, generally four in number, which are placed across the stream about 8-10 feet above those at the bottom of it, having also to extend into either bank of the stream, and serve at the same time as a bridge across it.

Before the uprights strong timbers or planks are fastened

tightly, which have also to extend 3-4 feet into either bank of the stream.

Where the nature of the banks is such as not to afford sufficient support to the timbers, the latter has to be got up artificially, either by masonry or by forming a large framework out of logs, which is filled up with stones (Fig. 10).

In the centre of the lock one or two gates are provided for the passage of the rafts by having two or three of the uprights provided with mortices, into which square pieces of timber are laid, tenon like, and are kept into their places by the pressure of the water, thus closing the gate.

In one of the uprights the mortices have to be open on the side looking up stream and twice as deep as the closed mortice in the other post, so as to allow the timbers to be pushed out of the closed mortice.

By means of this arrangement the timbers closing the gate or gates are easily removed with a strong crowbar, or a beam, and with these or a boat hook hauled into the sides.

Where the volume of water is very great sluices are also constructed at the side of the gate so as to expedite the letting off of the water.

The gates and sluices are usually thrown open one to two hours before the raft arrives so that not more than two and a half to three feet of water is left in them for the passage of the raft which travelling on water supplied by locks above, soon overtakes this water also, as it travels faster than the latter, and has to be checked and even sometimes stopped to let the water get ahead of it again.

For the lifting or raising of the raft, three spars are fixed slanting through the raft, and well secured with ropes or withs.

They are made 10 to 12 feet long and chosen from the butt end of Scotch fir, if procurable.

In the case of stoppage of the raft being caused by one of them it is quickly loosened by the cutting of the ropes or withs with which it is tied, and if the spar breaks, spare ones are carried on the raft to replace it.

The latter are built at suitable places in the streams, where the timber is previously collected.

Floating is carried on during March, April, and May, but chiefly in April.

The size of the raft varies, as a matter of course, according to the size of the stream, and whilst on the smaller ones three or four men are placed to guide them, on the larger

ones, which are sometimes 16 feet broad and reach a length of 2,000 feet, 16 or 18 men are placed.

Wherever necessary logs are also placed on the sides of the stream or across the bottom of it so as to prevent the bed being washed out or very uneven, besides allowing also the rafts to pass over them much more evenly than over the rocks alone. Improvement
of streams.

They are fastened by wooden spikes both vertically and horizontally.